The electrochemical methodology in the synthesis of N-acyloxazolidin-2-ones and in the asymmetric induction

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Chiral oxazolidin-2-ones (Evans' chiral auxiliaries) have been often utilized as chiral auxiliaries in a large number of asymmetric reactions.[1] A considerable stereoselectivity has been induced using *N*-enoyl- and *N*-acyloxazolidin-2-ones in alkylation, acylation, aldol and Diels-Alder reactions.

Actually, the study of new procedures for the synthesis of chiral oxazolidin-2-ones and for *N*-acryloylation and *N*-acylation of oxazolidinones (under mild conditions, without the utilization of toxic and dangerous reagents and with good reaction yields) could be of interest. Recently, simple electrochemical methodologies for the synthesis of chiral oxazolidin-2-ones (by reaction of chiral amino alcohols with electrochemically activated CO_2[2]) and for the *N*-acryloylation of oxazolidinones (by reaction of oxazolidinones with electrochemically activated α,α'-polychloroketones[3]) have been reported by us.

Here we wish to report an alternative methodology for the *N*-acylation (under mild conditions and with good to high reaction yields) of chiral oxazolidin-2-ones. This new electrochemical synthesis is based on the deprotonation of the oxazolidinone carried out *via* electrogenerated bases (procedure "a", Scheme 1) or via direct cathodic reduction (procedure "b", Scheme 2). At last the results of a preliminart study on the electrochemical reduction of *N*-(α-bromoacyl)oxazolidin-2-ones, targeted to the achievement of a stereoselective electrochemical carboxylation process, will be proposed (Scheme 3).

General procedure for the *N*-acylation of chiral oxazolidin-2-ones.

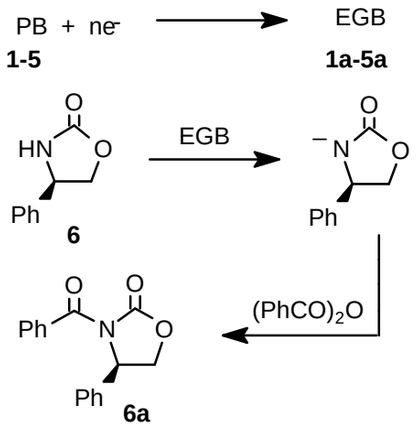
"a". Via electrogenerated bases (Scheme 1).

Used probases: **1**:2-pyrrolidone, **2**: tetraethyl ethylenetetracarboxylate, **3**: azobenzene, **4**: dioxygen, **5**: ethyl 2-bromo-2-methylpropionate.

Solutions of probases **2**-**5** and oxazolidin-2-one **6** in MeCN-0.1 mol dm^{-3} TEAP were electrolyzed under potentiostatic conditions in a divided cell (Hg cathode, Pt anode, room temperature). At the end of the electrolyses, benzoic anhydride was added to the cathodic solutions and allowed to stand overnight under stirring at r.t. (mole ratio PB / oxazolidinone / acylating agent: 1/1/1). Conventional work up of the solutions afforded *N*-acyloxazolidinone **6a** in good to high yields (65-96%).

Solutions of PB **1** in MeCN-0.1 mol dm^{-3} TEAP were electrolyzed under galvanostatic conditions in a divided cell (Pt cathode, Pt anode, room temperature). At the end of the electrolyses, oxazolidin-2-ones were added to the cathodic solutions and the mixture was stirred at r.t. for 30 min. Afterwards the acylating agents were added and the solutions stirred overnight at r.t. (mole ratio PB / oxazolidinone / acylating agent: 1/1/1 or 2/1/4). Conventional work up of the solutions afforded *N*-acyloxazolidinones in good to high yields (57-96%).

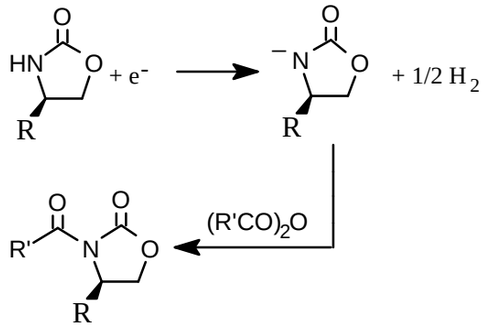
Scheme 1



"b". Via direct electrochemical reduction (Scheme 2).

Solutions of oxazolidin-2-ones in MeCN-0.1 mol dm^{-3} TEAP were electrolyzed under galvanostatic conditions in a divided cell (Pt cathode and anode, room temperature). At the end of the electrolyses, the acylating agents were added to the cathodic solutions and allowed to stand overnight under stirring at r.t. (mole ratio oxazolidinone / acylating agent: 1/1). Conventional work up of the solutions afforded *N*-acyloxazolidinones in high yields (86-97%).

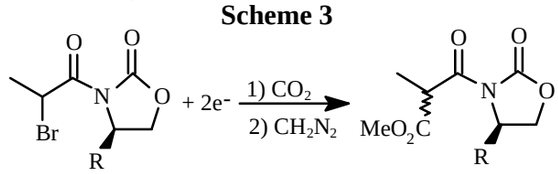
Scheme 2



Stereoselective electrochemical carboxylation of N-(α-bromoacyl)oxazolidin-2-ones (Scheme 3).

Solutions of *N*-(α-bromoacyl)oxazolidin-2-ones in MeCN-0.1 mol dm^{-3} TEAP or THF-0.1 mol dm^{-3} TBATFB were electrolyzed under potentiostatic or galvanostatic conditions in an undivided cell (Pb cathode, Mg anode) with continuous CO_2 bubbling at various temperature. At the end of the electrolyses, the solutions, after the usual work up, were treated with diazomethane an the carboxylic esters isolates.

Scheme 3



40-60%
(d.r. up to 83:17)

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